

# Redfish



Issue 1, July 2011

## Colourful clowns

Spawning clownfish in the aquarium

Coldwater



Goldfish through the ages

Tropical



Guppies explained!

Projects



Plants for the pond



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AquaReef 400



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Arctic Chillers

	HP	MAX L	
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1/3HP	1200-3600L/h	650L	46x39x52cm
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The AquaReef contains an inbuilt sump filtration system and protein skimmer!

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MODEL	VOLUME	DIMENSIONS
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AquaReef 400	400L	132 L x 52 D x 73/88 cm H
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This month's Eye Candy Contents Page Photos courtesy:

(Top row. Left to Right)

'Sharknose Goby on Brain Coral' by Laszlo Ilyes

'The Smartest Of The Goldfish' by Garrett Rooney

'Purple and Orange Starfish on the Beach' by Mark Walz

'Goldy' by Edna Silverbush

'Close encounter of the elegant kind'

by Andrea 'spettacolo puro'

(Bottom row. Left to Right)

'Fisheye' by Andrea 'spettacolo puro'

'HM Red M - Sarawut' by Daniella Vereeken

'heres lookin at you fish' by Beckie 'Xbeckieboox'

'pleco' by Jackie Finn-Irwin

'water lilies' by Louise Docker





#### General Advice Warning

The advice contained in this publication is general in nature and has been prepared without understanding your personal situation, experience, setup, livestock and/or environmental conditions.

This general advice is not a substitute for, or equivalent of, advice from a professional aquarist, aquarium retailer or veterinarian.

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# About Redfish

Redfish is a free-to-read magazine  
for fishkeeping enthusiasts.

At Redfish we believe in the free exchange of information to facilitate success by aquarium and pond hobbyists. Each month Redfish Magazine will bring you dedicated sections on tropical, coldwater, marine and ponds.

Redfish was founded in early 2011 by Jessica Drake,  
Nicole Sawyer, Julian Corlet and David Midgley.

We hope you enjoy this, the first issue of Redfish.

古池や蛙飛込む水の音  
ふるいけやかわずとびこむみずのおと



# LETTERS & NEWS

## WWF WARNS OF AN URGENT NEED TO STOP AMAZON DEFORESTATION



Brasilia, Brazil – A satellite survey just released by Brazil's National Space Sciences Institute (INPE) reveals that more than 23,000 square kilometres of Amazon forest – about half the area of Switzerland – disappeared between August 2002 and 2003 due primarily to a large expansion in cattle ranching and industrial-scale farming.

According to data from WWF-Brazil, the greatest rate of deforestation is occurring in those areas identified by government and scientists as key to the conservation of species in the Amazon. One area has disappeared, while five others have lost half of their forest cover.



"It is extremely alarming that the rate of deforestation shows no sign of slowing for the second year running," said Denise Hamu, Chief Executive Officer of WWF Brazil. "The government of Brazil needs to urgently respond to this crisis by fulfilling its commitment to triple the area of rainforest under legal protection."



In 1998, in partnership with the World Bank, the Global Environment Facility and WWF, the Brazilian government pledged to triple the amount of rainforest then under protection by setting aside at least 12 per cent of the Amazon for conservation by 2013.

In 2002 under the Amazon Regional Protected Areas programme (ARPA) the Tumucumaque National Park, covering more than 38,000 square kilometres was declared a protected area. But although a number of biologically critical areas have since been identified for inclusion in the ARPA network, no new protected area has been declared over the past year.



Furthermore, WWF is concerned that some states have reduced the size of their national parks and that others have reportedly failed to address the needs of entire communities, who have been forcefully evicted from their traditional lands by illegal settlers.

"The government deforestation data is alarming, and underscores the need to move rapidly with plans to zone the most biologically important parts of the Amazon into both strictly protected areas and those where resource use is regulated and sustainable," said Chris Elliott, Director of WWF International's Forest Programme. "Research shows that protected areas, buffered by other zones of sustainable land use are the most effective means of controlling deforestation."



WWF welcomes a government action plan, announced two weeks ago, which highlighted the importance of creating a network of protected areas as envisioned under ARPA. The plan also called for a crackdown on illegal logging and mining, a series of zoning restrictions, and stiffer penalties for offenders.

The editors of Redfish note that many tropical fish species, central to the fish-keeping hobby, are from the Amazon. Their home is threatened and we too hope the latest conservation measures can ameliorate the destruction. 🌿



Photos (top to bottom): Inside the Amazon forest by Jorge Andrade, *Acarichthys heckeli*, *Ancistrus* species by Chrisdian Ude, *Mikrogeophagus altispinosus* by úlfhams íkingur, Serpae tetra by Luke Underwood, Oscar by Daniella Vereeken



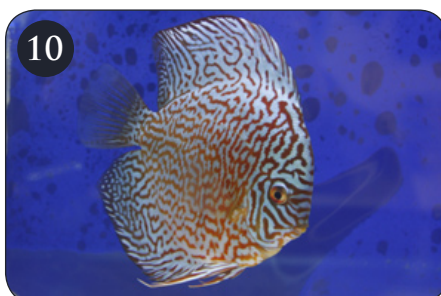
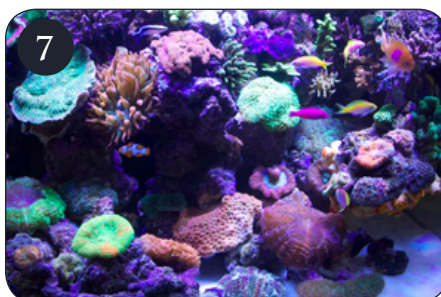
# LETTERS & NEWS

ANTHONY FROM REEF RIVER REPTILE TAKES US ON A PHOTO TOUR OF AQUARAMA 2011.

The 12th Aquarama took place from May 26-29 at Suntec, Singapore and this year boasted over 120 exhibitors from more than 20 countries. Featuring a range of seminars for the public and retailers, the show has grown into the premier event on the aquarium industry calendar.

During the course of the three day programme, over 8500 visitors filed through Aquarama's doors, amazed at the range and spectacle of aquatic artistry and high-tech wizardry on show. Along with the exhibitor stalls, Aquarama features aquascaping and fish breeding competitions.

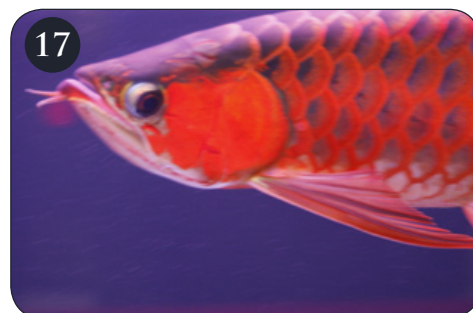
Anthony Ramsey takes us on a photographic tour of the show!





## PHOTO GALLERY

1. This vibrantly coloured reef tank won first place in the marine reef competition.
2. This planted tank, with its vertical poles, took out third place in the planted tank competition
3. The international fish competition featured a range of species including Arowana, Goldfish and Discus.
4. A spectacular planted tank full of lush green Bolbitus, Anubias and Vall. Amazing driftwood completes the scene.
5. A high quality Pigeon-blood Discus.
6. Hundreds of Bettas on show for the International Betta Competition. The colour and finnage on display was amazing!
7. Testament to the standard of reefkeeping on show, this beautiful tank was awarded second prize!
8. A bright red Arowana!
9. Another gorgeous reef display tank. All of these tanks were set up in a single day!
10. The grand champion Turquoise Snakeskin Discus.
11. A typical fish farm in SE Asia, this one produced platys for the export market.
12. A Dutch style planted tank on one of the distributors stands.
13. A new variety of Archer fish (*Toxotes chatareus*) features more patterning than the forms we're used to seeing.
14. Eheim and some other distributors had impressive stands.
15. A beautiful golden Arowana.
16. Another stunning Arowana.
17. Chilli red Arowana, this fish won the Arowana competition and illustrates the strides made in line breeding of these fish.
18. Hand picked fish ready to be taken to the airport and distributed internationally.
19. Eheim's new nano. These are very refined tanks and offer LED lighting. 🌿



## Aqua One ProSkim Protein Skimmers



The ProSkim is the latest series of Protein Skimmers developed by Aqua One for the easy and effective removal of organic waste from aquarium water.

The ProSkim has variable mounting options that allow for use in either in-sump or hang-on style placement and features simple to use controls to adjust output quickly and easily with minimal effort. The needle wheel impeller reduces the bubble size, creating a greater surface area for the collection of organic waste.

The result is cleaner, clearer water and healthier aquarium inhabitants!

Specifications:

ProSkim G216 - Flow Rate: 1400L/hr, Max. Aquarium Volume: 400L, 20W  
ProSkim G220 - Flow Rate: 1400L/hr, Max. Aquarium Volume: 800L, 35W  
ProSkim G224 - Flow Rate: 1850/hr, Max. Aquarium Volume: 1000L, 35W

Aqua One products are widely available at most quality pet retailers.  
To find your nearest retailer, visit [www.aquaone.com.au](http://www.aquaone.com.au)

## ThermoSafe Aquarium Heaters

Maintaining water temperature is an essential requirement for keeping fish happy and healthy, especially in tropical aquariums.

Aqua One ThermoSafe heaters are made from high quality quartz which makes them durable and shatter resistant. The thermal cut out protection safeguards the heater from damage if accidentally exposed to water shortage.

Simple to use, with an easy to read temperature guide, Aqua One ThermoSafe heaters are the optimum choice for your fish!

Aqua One products are widely available at most quality pet retailers.  
To find your nearest retailer, visit [www.aquaone.com.au](http://www.aquaone.com.au)



## Gadgets

### iTank Calculator

This stylish little app, available for some smart-phones, calculates aquarium volume from a range of different sizes.

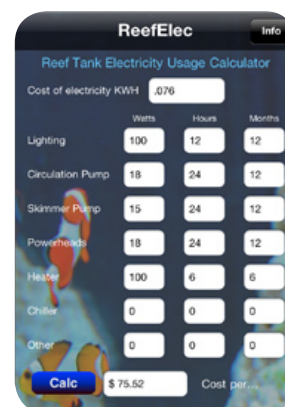
Particularly handy if you have multiple tanks or are unused to dosing your aquarium for water age, medications, food and supplements.



### ReefElec

With climate change continuing to effect power prices, more aquarists are interested in running their aquarium sustainably and at the same time reducing its running costs.

ReefElec, an app for smart phones, allows you to add up all your aquarium appliances and calculate the cost - handy!







Join our community  
Please, tell a friend about Redfish

# Corydoras sterbai

*Corydoras sterbai* is a popular, and somewhat more expensive, *Corydoras* catfish, typically sought after by cory enthusiasts or planted aquarium folk. Hailing from northern South America, the species is widespread, having been found in the Rio Guaporé, on the Bolivian/Brazilian border and the Rio Araguaia in central Brazil. In its natural habitat the species is found in soft acidic water, in small tributaries, creeks, pools or areas of flooded forest. In these habitats the species is found foraging among plants, submerged rocks and wood, sometimes in huge schools of over 100 individuals. The species is named for Dr. Günther Sterba, a German author of books for the fishkeeping hobby.

*C. sterbai* is a reasonably large *Corydoras* species, reaching 5-7cm in length. It is beautifully patterned and adults develop orange pectoral fins. Some specimens also display yellow to orange underbellies. As for most corys, females are typically larger, and when viewed from above are notably wider in the body.

Like all corys, *C. sterbai* should never be kept alone. The minimum number of *C. sterbai* that should be maintained is 4-6, though other similar *Corydoras* species can serve as suitable shoal-mates. If aquarium size permits it, larger schools of 10-20 behave in a more natural fashion. Plants and shelter are much appreciated by this species, and the aquarium should ideally be densely planted. While you might think you'll see less of this cory in a planted tank, the opposite is true, and the species is braver when it feels comfortable.

Ideal tankmates include small tetras or rasboras, though to be bred the species should be kept in a species aquarium. Particularly boisterous species, such as dwarf cichlids, should be avoided as they will result in *C. sterbai* spending much of its time hiding.

Breeding is as per other *Corydoras* species. Groups should be conditioned: notably high quality diets and regular, small water changes are important to induce spawning, the latter simulate rain in the natural environment. Pairs can be kept for spawning, though small harems with 1:2-3 m:f are also acceptable. The aquarist must watch carefully to ensure they do not miss spawning, as the pair will consume the eggs if left with them. After spawning, fish should be returned to their school. The dedicated breeding aquaria can be small <40L (10 gallon), ideally with a minimum of decoration aside from a sponge filter and some java moss. Eggs hatch within a week and fry, once their yolk sacs are absorbed, will accept newly hatched brine shrimp which can be swiftly followed with microworms, before moving to powdered flake foods.

Amongst the most beautiful of the corys, *C. sterbai* isn't notably harder to keep than its less expensive cousins, and is well worth a try if you're new to catfish. 🌿





# Guppies



*"My father was never particularly interested in fish. Primarily he was a geologist and a conchologist, and he wrote some 30 papers on the shells and fossils of Trinidad and the West Indies."*

Mr. Plantagenet (Jim) Guppy, 1934.

Robert John Lechmere Guppy, Lechmere, as he was called, was a British-Trinidadian civil engineer with no formal science training. A. D. Russel in 1922 described Lechmere as *"a man of remarkable individuality. Tall, gaunt, white-haired, grey-bearded, rugged in speech, combative in his opinions. A whiff of cold air seemed to go with him wherever he went. Watching him stride over this savannah, one imagined a Yorkshire moor."*

Lechmere, who had a passion for science and natural history, wrote a number of works on shells, fossils and the geology of his home in Trinidad and its nearby islands. Despite his extensive writing and obvious passion for these disciplines, he's best remembered as the man who has lent his name to arguably the most well known tropical fish in the aquarium industry: the guppy.

The name of the fish originally came from a contraction of an early scientific name *Girardinus guppii*, a name, as it happens, that was pre-dated by an earlier description of the same fish by dutch naturalist Wilhelm C. H. Peters. Lechmere's daughter, Enid Fraser, explains;

*"...my father was the first to discover the small livebearer here [in Trinidad] and was rather intrigued by its appearance. He sent specimens to London for cataloguing and scientific description by the then Keeper (Curator) of Zoology of the British Museum, the late Dr. Albert Carl Ludwig Got-*



Guppies are endemic to the northeast corner of South America and the islands adjacent to this coastline.

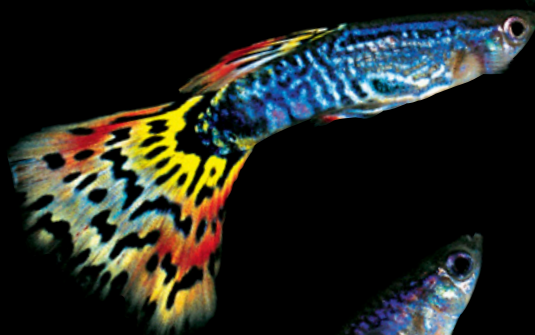
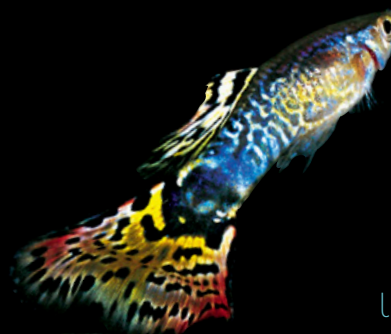
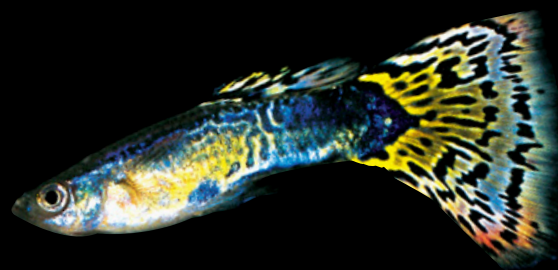
thilf Guenther. The latter named the fish *Girardinus guppii* in honor of my father, and this scientific label was employed long enough for its specific designation to be returned, by popular terminology, to its original form: Guppy. Later on, after research by many scientists had been collated, the title *Lebistes reticulatus* was decided upon as being the best scientific term for the fish, but despite all this technical change Dr. Guenther's original specific designation based upon my father's name, has continued in good standing throughout the world as the common name for the fish."

## Biology and distribution

There are three species of guppy which are variously classified and re-classified by taxonomists. The first is the commonly seen guppy in the aquarium trade, *Poecilia reticulata*. The second, *Poecilia wingei*, is traded and known commonly as Endler's guppy. Endler's guppies are commonly available in the aquarium trade and shouldn't be kept with common guppies as the two species readily hybridise. The third species of guppy, the swamp guppy (*Micropoecilia picta*) is less commonly available in the aquarium trade.

All species of guppies hail from the north-east corner of South America. The common guppy occurs naturally on the islands of Barbados, Antigua, the Netherlands Antilles, United States Virgin Islands, Trinidad and Tobago along with Venezuela, French Guiana, Guyana and Brazil on the South American continent.

Endler's guppy by contrast has a more limited distribution, occurring only in the Campoma- and Buena Vista Lagoons in Venezuela. The swamp guppy is also more restricted in its distribution, occurring in Brazil, Guyana, French Guiana, Trinidad and Tobago, typically in swamps and lagoons with



brackish water, close to the coast.

All guppy species are micro-predators whose primary prey items are insect larvae, or occasionally other water-living arthropods. As a small-growing species, guppies are frequently prey items for larger fish. As such, guppies are only common where predators are relatively rare. Frequently avoiding open water, they instead occur in densely vegetated flooded swamps or shallow streams. Guppies are livebearers, this means they don't lay eggs and instead give birth to relatively small clutches of free-swimming young.

## Aquaculture

Guppies are among the most aquacultured of any fish species on earth. Estimates in the late 1990s indicate that over 50 million guppies were exported from tropical fish farms in south-east Asia in a single year. The same data suggest that on a combined basis, guppies provide more money than discus to these businesses.

## In the aquarium

Guppy care in the aquarium is relatively straightforward. The species prefers moderately alkaline,





Female guppies are typically deeper bodied, larger and less colourful.

Photo by Roberto Verzo.

hard water with a pH around 7.5. The addition of sea salt is unnecessary, but not harmful. The species is tolerant of temperatures as low as 20°C (68°F), however, they are intolerant of very warm water (over 30°C, 86°F).

Guppies are peaceful fish that mix well with other non-aggressive fishes in community aquaria. Fish



Guppy habitat near Manzanilla, Trinidad  
Photo by Denni Schnapp

that nip at the fins of other species aren't suited as tankmates with guppies due to their fancy tails. Males constantly, and seemingly irritatingly - for the females at least - court females. As such, the aquarist should ensure that if females are included in the aquarium at all, then a few individuals are better than a solitary female.

## Breeding

Typically, breeding guppies is easier than not breeding guppies in your aquarium! Assuming you have males, females, water and cover for the young you're likely to be successful breeding guppies in the home aquarium.

The gestation period for female guppies is ~28 days. For those interested in guppy breeding specifically, rather than casually, multiple small aquariums and a means to separate female from male guppies are essential to ensure matings can be controlled.

If you're interested in breeding specific colour variants of guppies, it is probably worth seeking out other guppy enthusiasts in your area, as mated females (which are likely to be all guppies you buy from an aquarium) store sperm from earlier matings and can produce 6 or more clutches of fry using stored sperm. Virgin females, which are generally only available from guppy breeders, have been separated from males from birth and are a good choice for line breeding work.

## Conclusions

Guppy keeping, casually, or as a breeder of fancy guppies is a rewarding and interesting pastime. The species is well suited to beginners and makes an ideal addition to the tropical community aquarium! 🌿



Pools and streams around Argyle Falls, Tobago are also home to numerous varieties of guppy.  
Photo by Denni Schnapp





Neon tetra in the aquarium.  
Photo by Michelle Khuu



A cardinal tetra in the aquarium.  
Photo by Axel Rouvin

Amazon blackwater swamp. Photo courtesy Ivan Mlinaric

# Bright lights: Neon and Cardinal tetras

## Natural habitat

Neon tetras are native to the northern region of South America in western Brazil, eastern Peru and southeast Columbia. The species is heavily collected in the Rio Solimões, the Brazilian name for the stretch of river that runs from the Peruvian border in the west of Brazil to the rivers confluence with the Rio Negro near Manaus. In contrast, Cardinal tetras occur in the drainages of the Upper Rio Orinoco and Rio Negro, in Venezuela, Colombia and Brazil.

dark due to both its colour and the shade of the dense forest. The water is shallow and clear with a substrate of sand and very little silt. The water has a low pH (5.5-6.5) and is warm 28 - 33° C (82 - 91° F).



Both species occur in slow-moving creeks, ponds and minor tributaries, typically avoiding large open water stretches when there is sufficient water. When in larger water bodies, the fish typically school in much larger groups as protection from predators which include numerous cichlids including *Cichla*, leaf fishes, knifefish, needlefish and wolf fish. In these environments, the water is often



Wolfish are common predators of small tetras.  
Photo courtesy of Cláudio D. Timm

## Biology

Both Neon and Cardinal tetras are members of the genus *Paracheirodon*, a small group of characins endemic to this region of South America. All species are egg-laying, schooling, browsing omnivores that feed on small invertebrates that are attached to the dense root tangles and plants in their natural habitat. Females are typically deeper and wider bodied than males, particularly when sexually mature. In the wild, both species are generally short-lived and don't live much beyond one year.

## In the aquarium

Both Neon and Cardinal tetras are extremely popular aquarium fish. In the USA, over 15 million Neons are imported each year. Wildcaught stock is available in most countries, however, many Neon and Cardinal tetras are now bred from Southeast Asia, particularly in Thailand and Singapore. Neon tetras can be easily distinguished from the Cardinal tetra, by the length of the red line that runs along the base of the body. In the Cardinal tetra this red stripe covers the entire body, whilst in the Neon it begins in the mid-body and runs to the tail. Both are peaceful in the aquarium and require similar tankmates. Neither species should





Angelfish can sometimes eat Neon or Cardinal tetras and are not recommended tankmates. Photo by DenizZka.

Off the Rio Solimões, near Iquitos. Photo courtesy jimage@flickr

be kept alone and are best maintained in a school of 6-10 individuals, more where space permits. Despite being captive bred, Neon tetras, and to a lesser extent Cardinal tetras, can be of moderate difficulty to maintain. They are certainly not as difficult as some dwarf cichlids from the same region eg. *Apistogramma* species, though there are harder choices for the beginner aquarium. That being so, with a little knowledge their care is relatively straightforward.

Both Neon and Cardinal tetras do best in planted aquaria, preferably with dense plantings so the aquarist can observe relatively natural behaviours. In our experience, dark silica-based substrates make the fish feel at ease and enhance the colour of both species. Similarly, black backgrounds for the rear of the aquarium can have similar benefits and are to be recommended. Ideal tankmates include other small tetras and *Corydoras* catfish; many of which share the natural habitat of Neons and Cardinals. The aquarium water should be maintained at a slightly acidic pH, measures around 6.5 are sufficient. Being a small fish, aquarium size is less important, but be sure to have

enough room to house 6-10 of these beautiful fish. Feeding Neons and Cardinals in the aquarium is straightforward and they will accept most prepared foods. High quality, fresh and prepared foods are best, foods are best bought in small quantities as some foods cannot be stored indefinitely without losing nutritional quality. Occasional frozen daphnia are relished!

Health wise, both Neons and Cardinals have few issues, although Neon tetras are susceptible to Neon tetra disease. In our experience, Neons kept in stressful conditions, poor water quality, malnutrition and the like are considerably more prone to this disease.

### Breeding

Neon and Cardinal tetras are egg-scatterers and do not engage in brood care. They are best bred in ponds where warm weather or indoor heating permits, though aquarium breeding is possible. Dedicated breeding aquaria with a base grid to prevent parents eating the eggs are ideal. This breeding aquarium should be sparsely decorated with only java moss and a sponge filter and should not include any other tankmates.

Well-conditioned pairs should be placed into the breeding aquarium. Good frozen foods and regular small, and cool water changes (25° C / 77° F) normally induce spawning. Lighting the breeding aquarium is unnecessary and may hinder spawning. Clutch size from a mature female can number several hundred, though smaller spawns of 100 or so eggs are not uncommon.

One to two days post spawning the eggs hatch and become free-swimming within a week. Rotifers or greenwater make ideal first foods, both newly hatched brine shrimp and microworms are typically too large for the first month or so. After about a month both newly hatched brine shrimp and microworms should be offered regularly to assure rapid growth.

### Conclusions

Neon and Cardinal tetras are excellent fish for fishkeepers with a little experience in the tropical freshwater hobby. They are perhaps the most beautiful species available to the planted aquarists and there's little to rival a large school of either species swimming in a beautifully aquascaped aquarium. 🌿



# Nimbochromis

## FACT FILE

### Taxonomy

Malawi cichlid experts Dr. Michael Oliver, and Ad Konings suggest that *N. fuscotaeniatus* is unlikely to belong to the genus *Nimbochromis*. Based on morphology and behaviour the species is more likely to be a *Tyrannochromis* species.

### Distribution

The species is endemic to the southern regions of Lake Malawi and has not been detected north of Namalenje Island.

### Behaviour

The species is a solitary predator. Its prey are smaller fishes. In the wild, these are generally other cichlids.

### Keeping

In the aquarium, most predatory species can be intolerant of company, though it is not typically highly aggressive to fish of a similar size. The species displays some territorial behaviour but this is manageable provided suitable housing and stocking is provided.

Ideal Malawi tank mates include true *Nimbochromis*, Malawi eye-biters and other

# fuscotaeniatus

larger predatory haps. Larger mbuna can be included, however, a network of hiding places should be provided to ensure their safety.

If mbuna are absent, plants (such as Java fern) are tolerated -- if treated a bit roughly. The aquarium should include open water, ideal layouts have deep rock piles at one end of a long aquarium, or at the back (leaving the foreground open) of relatively deep aquariums. Being a large species that grows to 30cm (12 in.) aquarium size must be sensible to meet swimming requirements. Aquaria that are too small may result in more aggression.

### Sexual dimorphism & breeding

The species is typically haplochromine in its dimorphism and breeding style. Females are brown and smaller, males (below) are high coloured and larger. The species is a typical, maternal mouthbrooder that spawns readily in the aquarium. Females may need some recovery time after mouthbrooding to re-condition from the period in which they did not eat. Harems of 1-2m:5-7f are recommended, adjusted for aquarium size. ♣







## REDFISH MAGAZINE PHOTO CONTEST. JULY - SEPTEMBER 2011

Redfish Magazine is pleased to announce the first of its quarterly Aquarium Photo Contests for 2011-2012. Each month we'll publish our favourite reader submitted fish-related photos, and in October 2011, we'll announce the winners for this round.

The subject must be aquatic-related, though it's not limited to aquariums or ponds.

This quarter we are pleased to be able to offer the beautiful monograph 'The genus *Glossolepis*' as a prize! Printed in three languages and beautifully illustrated, it's a lovely small book.

**CODEWORD: CARDINAL**



### ENTERING THE PHOTO CONTEST

Entering the photo contest is simple. Email your name, the codeword, postal address and a high res. version of your photo to [competitions@redfishmagazine.com.au](mailto:competitions@redfishmagazine.com.au).

Please check the rules and regulations prior to entry.  
"Waiting for Separation" by Hamid Najafi.



### RULES AND REGULATIONS

Photo must be your own work. Post processing of your own images is allowed. You must be over 18 years of age to enter the competition.

Detailed rules and regulations are available at:  
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"Untitled" by D. Sharon Pruitt.

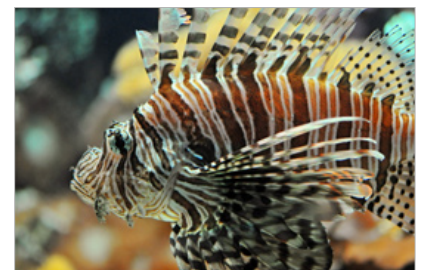
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Here are some amazing aquatic images!



"Sid Fishous" by Michelle Tribe



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# Koi Herpesvirus

## What is it?

Koi Herpesvirus (KHV) is a highly contagious disease of Common Carp, including Koi. It is caused by a Herpes\* virus. The first known case occurred in England in 1996, it is now found throughout the world in most countries. Goldfish are not affected, however, they may become carriers of the disease. Infection with KHV results in high mortality rates (80-100% are common). Survivors carry the virus and may infect non-immune stock.

## How is it transmitted?

The virus can be spread directly from an infected fish to a healthy one, and via anything which has been in contact with an infected fish such as water, gravel and nets etc. Introducing new fish to a pond is an obvious way that the virus might infect your fish, but Koi keepers should also be aware that fish shows are also a potential way for fish to be exposed. At shows, the risk of disease being transmitted is lowered (but not eliminated) if fish from individual owners are kept separate from each other and separate nets are used for each pond.

## Symptoms

KHV seriously damages the gills and as a result affected fish will tend to hang at the surface, swimming slowly, often in an uncoordinated way. They may exhibit respiratory distress and stop feeding. Infected gills may appear to be mottled in colouration, with red and white patches. There may also be blisters or ulcers, excessive skin mucus, sunken eyes, bleeding gills and pale skin patches. Not all symptoms are necessarily present. Infection with the virus makes fish more susceptible to secondary bacterial infections or parasites. This can make it difficult to diagnose KHV on appearance alone since an affected fish might show the typical appearance of another disease, thus masking the underlying presence of KHV. Fish usually die within 24-48 hours of the first signs of disease. Some fish may survive and make a complete recovery, never showing symptoms again.

## Treatment

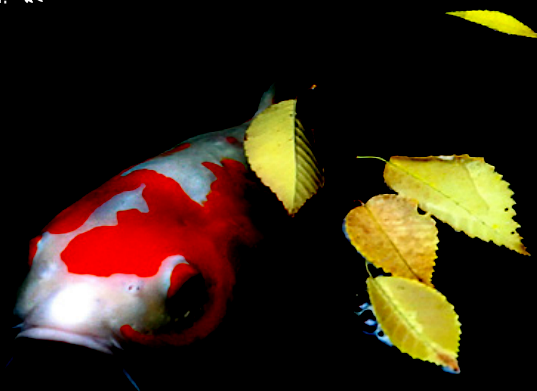
There are no antiviral drugs available to treat this disease. While some fish will survive, all survivors will be carriers of the virus and are forever a risk to other fish. Thus it is recommended that all fish in an affected pond should be humanely euthanized and all equipment and holding areas properly disinfected.

## Prevention

Strict quarantining of new fish, or fish that have been at shows and may have come into contact with other fish is essential. The virus is active when water temperatures are 22-25°C. The quarantine period needs to be for a minimum of 30 days, with the water temperature maintained at 24°C during the entire period. Whilst it is possible to test new fish for the presence of KHV, the tests are not simple and do not pick up all carriers of KHV. Testing and diagnosis should be carried out by a veterinarian or laboratory specialising in fish. Since carrier fish appear healthy and may never show symptoms of the disease this means that even the best quarantine practices do not guarantee that KHV will not appear in your fish. A vaccine would be an ideal preventive measure – some promising work has been done in this area but as yet a vaccine is not available.

## Conclusion

As KHV has the potential to wipe out an entire collection of valuable Koi, all Koi keepers should be aware of this disease, the ways in which it is spread and how it can be prevented. 🌸



\*this is not the same virus that causes herpes in humans. People can't get this disease from fish.





photo by Khantipol

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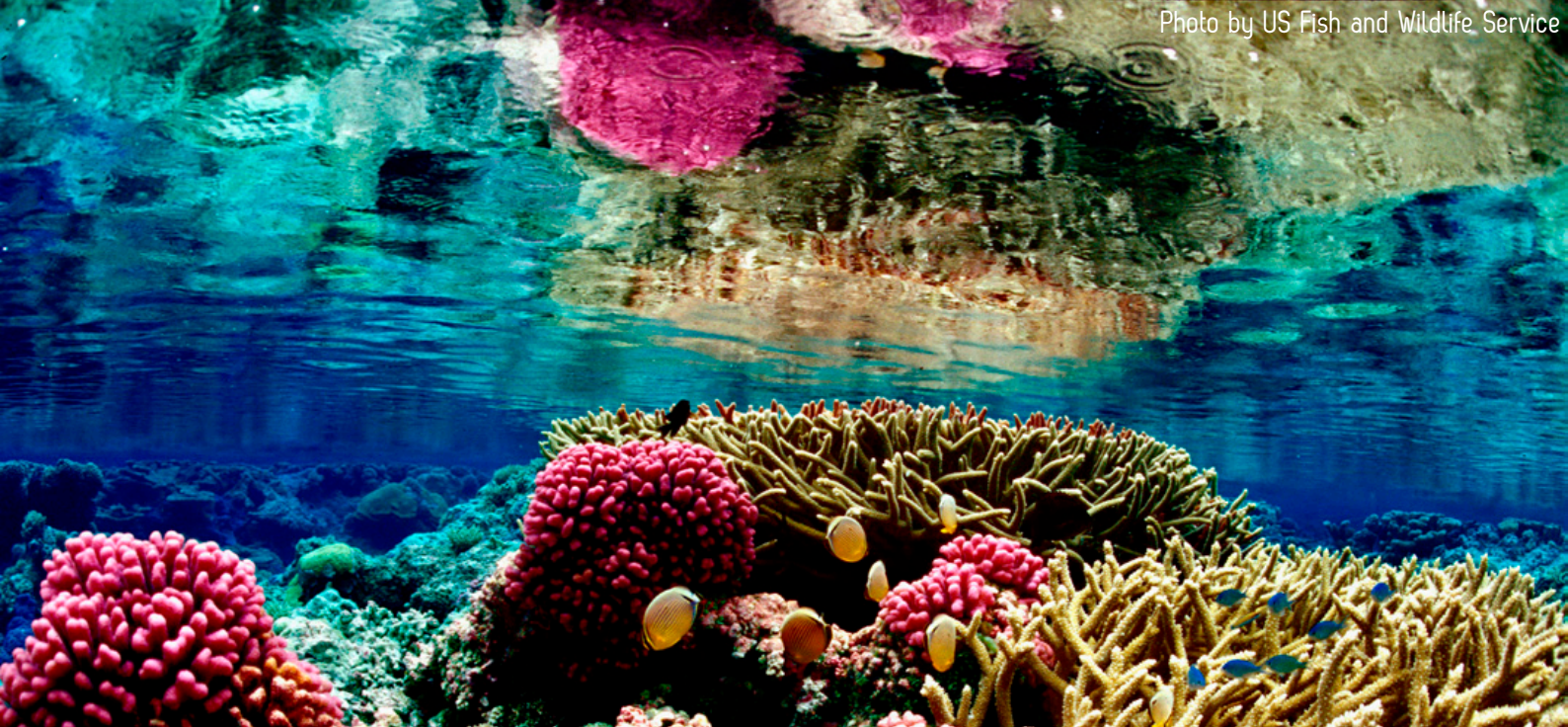
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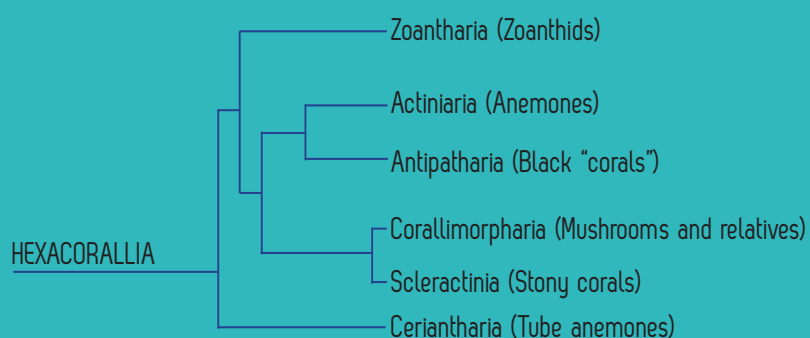
# Zoanthids – flowers of the reef

## INTRODUCTION

Zoanthids are the easiest cnidarians to maintain for the beginner. Along with most corallimorphs, many zoanthids make ideal first inverts for the new reef aquarist. These fascinating little inverts are sometimes described and traded as colonial anemones – an apt – if innacurate, description. The truth of the matter is zoanthids are not anemones, and they're not corals either – they're their own kind of cnidarian from the order Zoantharia.

The phylogenetic tree below illustrates their relationship with the rest of subclass Hexacorallia, a group that includes zoanthids, anemones and corals. Recent data suggests zoanthids may be a basal lineage within the group, suggesting that corals and anemones are more closely related to each other than they are to zoanthids.

Unlike anemones zoanthids are truly colonial animals, connected physiologically via a structure called a stolon (which is similar to a plant stolon, think of strawberry plants or grass runners) or a fleshy mat (or cushion) like structure.



Zoanthids aren't stony in the sense that they secrete calcium skeletons, but some species incorporate sand and small pieces of rock into their structure. This addition strengthens the structure of the animal making it more rigid and presumably also aids in its defence. Handily, it's also a useful method for distinguishing zoanthid genera, as it appears to occur in some groups but not others.

## TAXONOMY

Depending on the system of taxonomy one sub-





Zoanthids come in a range of colours. Photo courtesy: Paul J. Thompson.

these organisms isn't straightforward, and, given that most species have similar requirements, it is not of the utmost importance. It should be noted though that any organism suspected of being a *Protopalythoa* species should be placed a distance from stony corals as these species produce a toxic mucus which can harm stony corals.

## BIOLOGY & AQUARIUM KEEPING

Regardless of which species you have, almost all zoanthids have a flattened oral disk, with two rows of tentacles that radiate outward from the edges. These tentacles are short and blunt in some zoanthids, mostly in *Zoanthus* spp., and longer and tapered in other species (*Protopalythoa* & *Palythoa*). Like all cnidarians, they have just a single opening through which food is consumed and waste excreted.

In the wild, zoanthids frequently occupy niches that are more challenging and where corals would struggle to survive. These challenges include intertidal drying, pollution and relatively low light conditions. This exploitation of more challenging environments in the wild is what makes zoanthids ideal in the aquarium: put simply they are more tolerant of aquarium conditions and mistakes that might stress corals or other more sensitive invertebrates. Indeed, many zoanthids appear on their own, without the intervention of the aquarist on live rock used to cycle the aquarium. When you consider what live rock has been through – it's frequently sold exposed to air and wet by showering water sprays rather than being submerged, many of the original creatures living on the rocks have died during collection and processing, resulting in ammonia and nitrite spiking – the survival (or indeed, success) of zoanthids in aquariums is pretty unsurprising.

With regard to placement in the aquarium, most zoanthids that arrive on live rock sort out their own placement, a process which can add to the natural look of the aquarium: the only real caveat to this process is the issues with toxic mucus discussed earlier.

Mucous aside, in terms of aggression, many corals tolerate the presence of zoanthids well. Some zoanthids appear to be unaware corals

scribes to, order Zoantharia contains ~12–15 species. Some contain symbiotic zooxanthellae (algae) that live within the tissues of the organism, undertaking photosynthesis and supplying the zoanthid with sugars. Like many other marine invertebrates this symbiosis somewhat limits the distribution of those organisms reliant upon their zooxanthellae to clear shallow waters where photosynthesis can be undertaken. Wikipedia currently lists 12 genera which span five families.

Of these 12 genera, *Protopalythoa*, *Palythoa*, *Isaurus*, *Acrozoanthus* and *Zoanthus* species are most commonly encountered in reef aquariums. Identifying

### ZOANTHIDS

#### Family Abyossoanthidae

>> Genus *Abyossoanthus*

#### Family Epizoanthidae

>> Genus *Epizoanthus*

#### Family Parazoanthidae

>> Genus *Parazoanthus*

>> Genus *Isozoanthus*

>> Genus *Savalia* (-*Gerardia*)

>> Genus *Mesozoanthus*

#### Family Sphenopidae

>> Genus *Palythoa*

>> Genus *Protopalythoa*

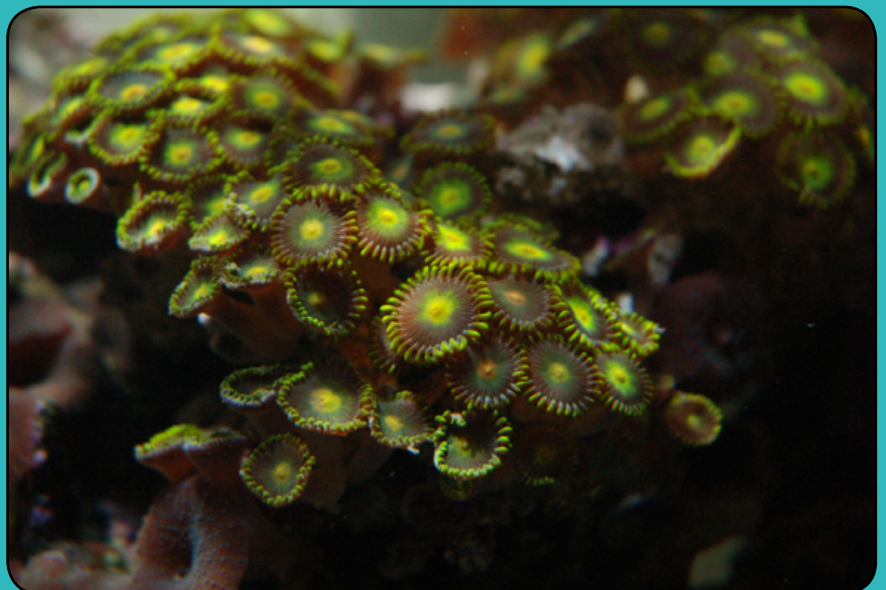
>> Genus *Sphenopus*

#### Family Zoanthidae

>> Genus *Zoanthus*

>> Genus *Acrozoanthus*

>> Genus *Isaurus*



A beautiful green zoanthid. Photo courtesy Paul J. Thompson.



are present and can sometimes grow over the top, or amongst corals. This enthusiasm for proliferation can be more of a problem than stinging *per se*, and they can overgrow some particularly slow-growing corals, shading them and causing a decline in health or, if no intervention is forthcoming: death. It's not one way traffic, however, and some scleractinian corals with longer tentacles (*Gonioporia* anyone?) can sting and kill zoanthids. In general, different zoanthid species can be placed together without issue.

*As with all interactions, and there are a plethora possible in the reef aquarium, vigilance is the best policy.*

On the issue of feeding it's worth noting: all zoanthids, regardless of whether they are carrying photosynthetic symbionts, require feeding. That said, the success of most zoanthids in aquariums is suggestive that under normal aquarium feeding regimes zoanthids generally get enough food to live and proliferate. Good water movement within the aquarium ensures that food added to the aquarium circulates well. In addition, it prevents debris from landing on the polyps which is also beneficial and helps keep algal growth to a minimum on sessile inverts.



*Protopalychia* sp. often grow from live rock installed during aquarium setup.



Stunningly azure zoanthids are commonly available.  
Photo courtesy: Kien Tran.



A beautiful orange & violet zoanthid  
Photo courtesy: Kien Tran.

Newly available submersible propeller-driven pumps are ideal for creating water movement in the reef aquarium and are preferred, both because they perform better in creating more natural currents and use less power, compared to older technology such as powerheads.

#### PESTS & DISEASES

As stated above zoanthids are generally very hardy animals, distress in your zoanthids is normally occurring long after the death of most other invertebrates. While this is generally true, there are some specific ailments and predators that can affect zoanthids.

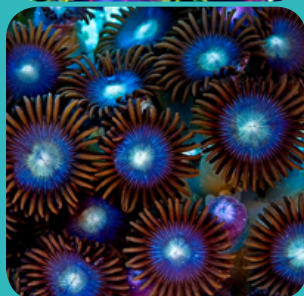
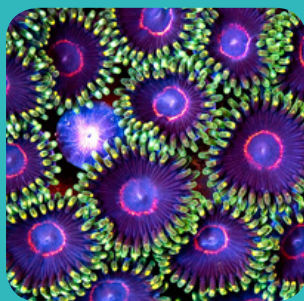
The first is variously known as Zoa Pox or Zoanthid disease. This disease is likely to be bacterial, though definitive evidence is lacking. The disease begins as small white marks/spots which appear on the 'stalk' of individual polyps. The polyps don't open, and other polyps within the colony (and within the aquarium broadly) also begin to show signs of stress. Treatment with nitrofurans (such as Furan 2) has been shown to be effective. This class of drug is restricted in some jurisdictions, so seek specialist veterinary advice if your local fish shop is unable to provide these medications.

Most animals that graze coral polyps will also snack on zoanthids, however, there are some specific zoanthid predators that include some bristleworms, sundial snails (*Helicatus* sp.), zoanthid eating nudibranchs and *Platypodiella* spp. crabs. Any fish that is considered unsafe with corals should also be considered unsafe with zoanthids. Oddly, some zoanthids seem less "edible" than others, so it's not uncommon to see *Palythoa* or *Protopalychia* thriving, whilst your *Zoanthus* spp., are devoured. Close inspection, particularly during the night, using a torch, can reveal the culprits who can then be removed manually or via trapping. Pieces of zoanthids acquired from your local fish store can sometimes





*Protapalythoa* have tentacles that taper gently towards the tip.  
Photo courtesy: Jaime Franch - flickr.com/photos/ninopez/

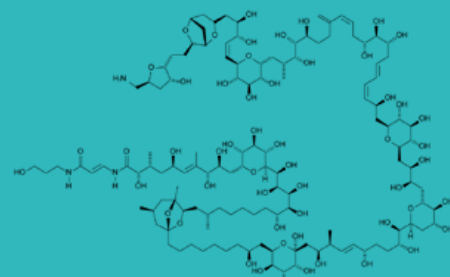


These beautiful macro photos by Jennifer Prince illustrate the stunning colour of zoanthids!  
flickr.com/photos/princer7/

also bleach, and while this may be lethal in many corals, zoanthids generally recover.

As a final aside it's worth noting that some zoanthids contain a compound called palytoxin (shown below). While not all zoanthids contain this compound, and its mode of entry into the human body isn't well defined common sense dictates that a healthy respect of the potential dangers of this compound is essential.

To that end, we'd encourage anyone handling zoanthids to take all appropriate precautions to protect themselves. Indeed, we'd recommend you speak to your local aquatic retailer (or even a medical professional) about the potential risks and how to protect yourself. Just in case any readers think we are being overly cautious, we'd suggest reading the following paper:



Hoffmann K, Hermanns-Clausen M, Buhl C, Büchler MW, Schemmer P, Mebs D and Kaferstein S (2010) A case of palytoxin poisoning due to contact with zoanthid corals through a skin injury. *Toxicon*. 51(8): 1535-1537. doi:10.1016/j.toxicon.2008.03.009

It details the poisoning (and hospitalisation for 3 days) of an aquarist. So palytoxin is a serious business. The zoanthid this aquarist had been handling contained 2-3 mg/g of palytoxin. That's at least 100x more poison in a gram of this animal than is required to kill an adult human.

In summary, zoanthids make ideal first inverts for the reef aquarium that's finished its cycling using live rock. They come in a range of colours and forms that are sure to find a place in your aquarium. The ready growth can aid the reef aquarist in establishing a natural looking reef in your home. They are easy to maintain, and seem to require little additional care, in and of themselves. 🌿





# Spawning the CLOWNFISH

The strategy when breeding clownfishes is similar to breeding most other fishes and involves three important steps: Conditioning, Spawning and Fry raising.

## INTRODUCTION

Clownfish, also known as anemone fish, are perciform fishes in the family Pomacentridae. These iconic saltwater fishes are probably the easiest marine fish of interest to aquarists to breed in captivity. Like their freshwater relatives the cichlids, Pomacentrids typically practice some form of brood care. This behaviour makes spawning these fish easier as they are less likely to eat their own eggs. The strategy when breeding clownfish is similar to breeding most other captive fish and involves three general steps: conditioning, spawning and fry raising.

## CONDITIONING

Firstly, a breeding pair must be established. Clownfish have an unusual gender physiology – all clownfish are born male and remain so while small. As they grow, the largest and most dominant fish in a group becomes a female, with the second largest fish becoming a sexually



Tomato Clownfish, *Amphiprion frenatus*  
Photo by Leonard Low

mature male and thus a breeding pair is formed. Male fish can metamorphose into females at any time, but once a fish has become a female the process cannot be reversed. This pattern of development and social hierarchy in a group of clownfish can make it challenging to isolate a breeding pair. The easiest ways to obtain a true pair are either to purchase a mated pair from a reputable source or to purchase two young (and therefore both male) fish and wait for them to mature, with the dominant fish becoming the female. If the latter method is used, be aware that there is likely to be some fighting amongst the two fish as they go through the process of establishing which one is the dominant fish.

Anyone who has bred cave spawning fresh-water cichlids will be reminded of the experience when attempting to spawn clownfishes. Like many cave spawning species, the pair is probably best isolated from other fish and invertebrate species except the most benign tankmates in a dedicated breeding aquarium. Although



Ocellaris clownfish, *Amphiprion ocellaris*  
Photo by Samuel Chow



clownfish are famous for their behaviour of living with a host anemone it is not necessary to have an anemone present to breed them. In nature, they lay their eggs on a cleaned area of rock at the base of their host anemone. In captivity most plant pots make acceptable spawning sites, as do pieces of tile or live rock.

It is important that the pair feels comfortable in their environment, so the aquarium should contain rocks and other tank furniture which can provide hiding places and good cover for the fish. A consistent 12 hour on/12 hour off lighting cycle via the use of a reliable timer is recommended as part of the conditioning process. Of course, as with breeding any fish in captivity, good water quality is necessary. In order for the parents to be able to produce good quality eggs they need to receive a balanced and nutritious high quality diet. A mix of frozen and flake food is a solid foundation, but adding some live food such as Mysis or baby brine shrimp can really help to bring the pair into excellent physical condition for breeding.

## SPAWNING

Getting to the actual spawning stage requires patience. It can take quite some time for a pair to settle in to their environment and get to the point where they are ready to breed. Expect a minimum of two months to pass before even a well established pair may start to spawn and be prepared that it may take as long as several years!

When the pair finally decide that they are ready, some signs of pre-spawning behaviour may be noticed. The male should start cleaning a piece of rock or plant pot to prepare a spawning site. He is meticulous in this task but his mate is also very scrupulous and will sometimes assist in the cleaning if she doesn't think the job he has done is good enough. Whilst cleaning behaviour is a good sign it doesn't necessarily mean that spawning is imminent. The process of cleaning can go on for quite some time before the pair actually gets down to spawning. During this time, the conditioning strategies as mentioned above should be maintained consistently.

Close observation of both fish will help to



Tomato clownfish, *Amphiprion frenatus*  
Photo by Brian Gratwicke

alert the aquarist to imminent spawning. The female may become thicker around her body quite rapidly as she becomes gravid (full of eggs) but this can be a subtle sign that is easily missed and may not be obvious for some individual fish. The best indication that the fish are about to spawn is the appearance of an ovulation tube on the female. This is a short fleshy protuberance which can be seen descending downward from her body, near her anus. This tube appears on the day of laying, with the actual egg-laying usually starting about 4 to 5 hours before the lights go off for that day. This explains why a consistent lighting schedule is necessary – the fish need to become used to a rhythm of lighting that allows them to know when to spawn.



Yellow clownfish, *Amphiprion sandaracinos*  
Photo by Jenny Huang



Red sea clownfish, *Amphiprion bicinctus*  
Photo by Magnus Kjaergaard

Laying of the eggs tends to occur over an hour or two. The female will rub her body on the spawning site and leave a trail of eggs behind her. After she has done this a couple of times, the male will swim over the eggs and fertilise them. The process is then repeated until a clutch of eggs numbering from as few as 50 (common with first spawns) to as many as 1000 are laid. The male will now perform the job of constantly fanning his fins over the eggs to provide a good flow of oxygenated water to them. He will also keep the area clean and free of detritus. Meanwhile, the female guards the spawning site and is the overall protector of the male and the clutch of eggs, often aggressively fending off any creatures that should venture too close. The colour of the eggs can be an indication of the overall health of the spawn. Bright orange eggs are of good quality and should be expected to produce excellent hatchlings. Eggs of other colours – such as yellow, green or clear are either of low quality or have not been fertilised. These eggs will most likely die or decay and as they do so they are cleaned away by the fastidious male.

## FRY RAISING

Hatching occurs in about 7-10 days from the time of laying. It is possible to predict quite accurately when the eggs will hatch. Eggs that are on the verge of hatching will develop a silvery sheen and it should be possible to see the silver eye of the hatchling inside the egg. Once this is present the egg is ready for the hatchling to emerge shortly after the lights go out that evening.

As soon as they have hatched, the fry need to be removed to a dedicated fry raising tank which should have been properly cycled and established well in advance of hatching. This tank should have very gentle filtration, such as an air driven sponge filter, as the fry can be killed by strong currents or being sucked into pumps. The easiest way to get the fry into this tank is to remove the spawning site itself, with eggs attached, from the parent tank and into the fry raising tank just prior to hatching (i.e. just before lights out, once eyes can be seen in the eggs). The eggs must be kept underwater at all times during the move, so this is best performed by lowering a container down to the site, placing it inside and removing it with enough water to cover the eggs completely. A new piece of tile, pot or rock is placed in the same area so that the pair can spawn again.

If the fish have spawned on a rock which can't be moved safely in this way then the eggs should be left to hatch in the parent tank and the fry harvested shortly after hatching. Prior to the lights going off for the night all pumps should be turned off to prevent fry being sucked into filters or washed around in currents excessively. The fry will also be attracted to the heater and can be burnt by it so this will also need to be turned off temporarily. Clownfish fry are attracted to light, which is fortunate, since the actual catching of them will be performed in the dark! All room and tank lights should be turned off. A torch is used to attract the fry to one corner of the tank, where they can be scooped out with a ladle. It is also possible to siphon them into a container, which is a faster method, but this must be done gently so as not to kill the delicate fry. Take care not to shine the torch onto the unhatched eggs as this will prevent them from hatching that night. Any



Clark's clownfish, *Amphiprion clarkii*  
Photo by Chika Watanabe



fry which have not hatched after 2 hours past lights out are not likely to hatch that night, so all equipment (except the lights, which remain on the scheduled timer) can be turned back on and the process repeated the next night to gather the remaining fry.

Newly hatched clownfish fry are delicate and a labour-intensive process is required to get them through the first (and most difficult) 10-14 days of their life. They need to be fed live microscopic foods in the first 5 days of life before moving on to baby brine shrimp. This means that it is essential to have live cultures of green water and rotifers at the ready for hatching time as only a tiny percentage of fry will survive if live food is not offered.

A combination of live rotifers and green water should be fed 2-4 times daily. Because these organisms are microscopic it is difficult to know exactly what quantity to feed, since they can't be seen with the naked eye! Overfeeding, even of live food, can cause a deadly ammonia spike, so it's best to feed very small amounts frequently rather than risk putting in too much at once. Feeding the right amount – not so much as to cause fouling of the water, and not so little as to starve the fry – is a fine art often learned by experience in raising the tiny fry of a variety of fish species.

The fry are very sensitive to water quality so to keep losses at a minimum the fry tank should be cleaned twice daily, prior to feeding. No matter how well they are looked after it is not unusual for some fry to die in the first few days. Dead fry can be removed by siphoning using standard airline tubing as the siphon pipe. Live fry can be lured away from the area being siphoned using a torch as they are still attracted to light in these early days. A partial water change is performed at the same time – about 10% is safe and beneficial.

At day 5 a small amount of baby brine shrimp (BBS) can be offered. Not all of the fry will be able to eat food of this size, so be careful with the amount fed and continue to provide rotifers for the smaller fry. By day 10 all fry should be able to eat BBS and the largest fry may start to metamorphose from the larval to the juvenile stage. During this process they are very vulnerable and losses can occur. It's best to stop doing water changes at this point – if



Pink skunk clownfish, *Amphiprion perideraion*  
Photo by Jenny Huang

feeding and maintenance has been done correctly over the past 10 days then water quality will hopefully be stable by now. Over the next few days the fry will develop the familiar colour and pattern of their species and will begin to swim and behave in a manner similar to adult fish. Once metamorphosis is complete the fry are considered to be relatively "safe" and can gradually be moved from being fed BBS to accepting new and larger food items as they themselves become large enough to eat these items.

## CONCLUSIONS

Spawning and raising clownfish to independence is now a regular occurrence in captivity, though it is by no means an easy feat. Anyone wishing to be successful in doing so should gain experience not only in keeping marine fish but also in the breeding and fry raising of some of the easier freshwater fish of similar habits, such as cave spawning cichlids. Achieving this goal however, is a hugely rewarding experience which can also contribute to the hobby by helping to provide a source of captive bred fish of the immensely popular Pomacentridae. 🌿

# Community Directory

## Britain

Anglia Reef Club	<a href="http://www.angliareefclub.org.uk/">http://www.angliareefclub.org.uk/</a>
Bracknell Aquarist Society	<a href="http://bracknellaquarist.wordpress.com/">http://bracknellaquarist.wordpress.com/</a>
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British Cichlid Association	<a href="http://www.britishcichlid.org.uk/">http://www.britishcichlid.org.uk/</a>
British Killifish Association	<a href="http://www.bka.org.uk/">http://www.bka.org.uk/</a>
British Koi Keeper's Society (BKKS)	
See website for UK sections	<a href="http://www.bkks.co.uk/">http://www.bkks.co.uk/</a>
Catfish Study Group	<a href="http://www.catfishstudygroup.org/">http://www.catfishstudygroup.org/</a>
Dunstable & District Aquarist Society	<a href="http://www.ddas.co.uk/">http://www.ddas.co.uk/</a>
Federation of Northern Aquarium Societies (FNAS)	
See website for list of associated clubs	<a href="http://www.fnas.org.uk/">http://www.fnas.org.uk/</a>
Greater Manchester Cichlid Society	<a href="http://www.nekrosoft.co.uk/gmcs/">http://www.nekrosoft.co.uk/gmcs/</a>
Hounslow & District Aquarists Society	<a href="http://myweb.tiscali.co.uk/hounslowfish/">http://myweb.tiscali.co.uk/hounslowfish/</a>
Ilford & District Aquarists & Pondkeepers Society	<a href="http://www.ilfordaquarists.co.uk/">http://www.ilfordaquarists.co.uk/</a>
Preston and District Aquatic Society	<a href="http://www.northtrop.co.uk/preston.html">http://www.northtrop.co.uk/preston.html</a>
Reigate and Redhill Aquarist Society	<a href="http://www.networkclub.co.uk/rras/">http://www.networkclub.co.uk/rras/</a>
Ryedale Aquarist Society	<a href="http://www.ryedaleaquaristsociety.co.uk/">http://www.ryedaleaquaristsociety.co.uk/</a>
Southend Leigh and District Aquarist Society	<a href="http://www.southendaquarist.co.uk/">http://www.southendaquarist.co.uk/</a>
Strood and District Aquarist Society	<a href="http://www.stroodaquarist.co.uk/">http://www.stroodaquarist.co.uk/</a>

## Scotland

Federation of Scottish Aquarist Societies.	
See website for list of associated clubs	<a href="http://www.scottishaquarist.co.uk/scottish_aquarium_society.htm">http://www.scottishaquarist.co.uk/scottish_aquarium_society.htm</a>
Aberdeen Fish Keeper's Club	<a href="http://sites.google.com/site/aberddeenfishkeepersclub/">http://sites.google.com/site/aberddeenfishkeepersclub/</a>
Greenock & District Aquarist Society	<a href="http://www.scottishaquarist.co.uk/greenock&amp;district_as.htm">http://www.scottishaquarist.co.uk/greenock&amp;district_as.htm</a>
Fair City Aquarist Society	<a href="http://www.faircityaquaristsociety.co.uk/">http://www.faircityaquaristsociety.co.uk/</a>
Union of Scottish Aquarists	<a href="http://www.fishwebusa.co.uk/">http://www.fishwebusa.co.uk/</a>
Capital Aquarist Society, Edinburgh	<a href="http://www.scottishaquarist.co.uk/capital_aquarists_society.htm">http://www.scottishaquarist.co.uk/capital_aquarists_society.htm</a>
Dundee & District Aquarist Society	<a href="http://www.scottishaquarist.co.uk/dundee&amp;district_aquarist_society.htm">http://www.scottishaquarist.co.uk/dundee&amp;district_aquarist_society.htm</a>
Glenrothes Aquarist Society	<a href="http://www.scottishaquarist.co.uk/glenrothes_aquarist_society.htm">http://www.scottishaquarist.co.uk/glenrothes_aquarist_society.htm</a>
Grangemouth Aquarist Society	<a href="http://www.scottishaquarist.co.uk/grangemouth_aquarist_society.htm">http://www.scottishaquarist.co.uk/grangemouth_aquarist_society.htm</a>
Lanarkshire Aquarist Society	<a href="http://www.scottishaquarist.co.uk/lanarkshire_aquarist_society.htm">http://www.scottishaquarist.co.uk/lanarkshire_aquarist_society.htm</a>
Musselburgh & District Aquarist Society	<a href="http://www.scottishaquarist.co.uk/musselburgh_a_s.htm">http://www.scottishaquarist.co.uk/musselburgh_a_s.htm</a>
Perth Aquarist Society	<a href="http://www.scottishaquarist.co.uk/perth_aquarist_society.htm">http://www.scottishaquarist.co.uk/perth_aquarist_society.htm</a>
Poecilia Aquarist Society	<a href="http://www.scottishaquarist.co.uk/poecilia_scotia.htm">http://www.scottishaquarist.co.uk/poecilia_scotia.htm</a>
Workington & District Aquarist Society	<a href="http://www.scottishaquarist.co.uk/workington_as.htm">http://www.scottishaquarist.co.uk/workington_as.htm</a>

## Wales

Newport & District Aquarist Society	<a href="http://kimnp19.tripod.com/">http://kimnp19.tripod.com/</a>
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## Ireland

Irish Midlands Aquatic Society	<a href="http://midlandsaquatic.weebly.com/index.html">http://midlandsaquatic.weebly.com/index.html</a>
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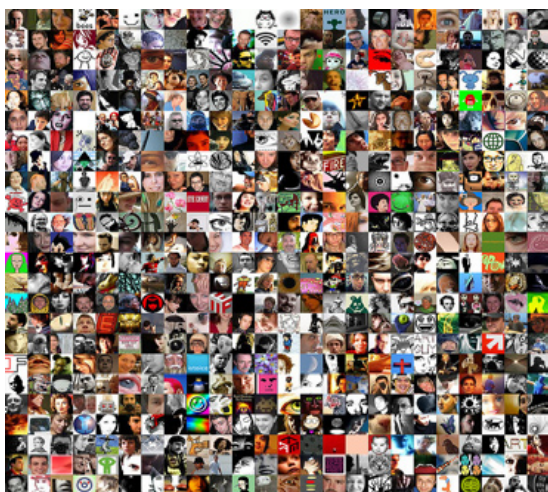


Photo by Hobvias Sudoneighm

## Be part of our community!

Our current listing is primarily from Britain, if you're part of a fishkeeping club or society on the Continent we'd love to add you to our list!

Email us at [enquiries@redfishmagazine.com.au](mailto:enquiries@redfishmagazine.com.au) to get listed here.



# GOLDFISH

## *through the ages*

### *Goldfish Breeds*

Even if you are not a goldfish fanatic the history of the development of the goldfish is a fascinating one, as it charts the very beginnings of the aquarium hobby. Many centuries of selective breeding and development of fishkeeping techniques have given us the great range of colour, pattern and form we have in the breeds of the present time.

The goldfish is probably the first domesticated ornamental fish. It was thought to have been derived from the Crucian Carp (*Carassius carassius*), however recent mitochondrial DNA studies have shown that the goldfish is actually descended from the Prussian (or Chinese Crucian) Carp (*Carassius auratus gibelio*). This species of carp looks very similar to the common goldfish in shape but is silver or pale olive in colour. Mutations in colour and form do happen sporadically in wild populations. People have taken advantage of this and over time have selected desirable (colour and form mutations) to breed from, forming new varieties of goldfish.

The first step towards the vast array of goldfish types we have today started as far back as 1700 years ago, in China. Various types of Asian carp were kept and reared as food fish, and amongst these normally silver or grey fish it was noticed that the occasional fish might be of a different colour – red, orange or yellow. Records of such fish have been found dating back to the Jin/Chun Dynasty (265-419 AD).

During the Tang Dynasty (618-907 AD) carp were frequently kept as ornamental fish in garden ponds and water features. Yellow coloured fish were kept preferentially over silver coloured fish and selectively bred to increase the availability of this mutation. These fish were occasionally displayed in small contain-



*Textures courtesy: Renee Robinson*



ers, particularly when important guests were expected. However at this time the fish were not kept permanently in such containers and would be released back in to a pond when they no longer needed to be on display. Also in this period gold coloured carp were released into the temple ponds of Buddhist monasteries as an act of kindness to a living animal, a doctrine of Buddhism. The goldfish became one of

the Eight Auspicious Symbols of Buddhism characterising eternity, fearlessness and freedom from suffering and worry.

It is thought that the domesticated goldfish we are familiar with today was established in the Song Dynasty (1127-1279 AD). Orange or yellow coloured fish were kept in ceramic bowls or ornamental ponds and were prized as a status symbol by the wealthy. In 1162 a special pond was built for the Empress of the Song Dynasty for the purpose of collecting the coloured varieties of goldfish. She decreed that only those of the Imperial Family should be allowed to keep the yellow fish, as yellow was the imperial colour.

The first reports of split tailed goldfish come from the time of the Ming Dynasty, during the 1400s when goldfish started to be kept in porcelain bowls as purely indoor ornamental fish. These, along with single tailed, coloured goldfish were imported into Japan from 1502 where they were named Wakin or Hibuna. Selective breeding of these fish quickly established many of the familiar fancy breeds we have today, in particular:

- The Ryukin – originally this form had a compact and rounded body with a divided tail and anal fin, today this style of fish would be called a Fantail. From the 1700s line breeding for an exaggerated shoulder hump led to the Ryukin of today.
- The Maruko or Eggfish – a short and round bodied fish which has a short split tail and lacks a dorsal fin. It is not often seen in the Western hobby but is still relatively popular in Asia. From this variety the Lionhead emerged in China during the 1600s. Further refinement of the Lionhead took place in Japan in the 1800s to form the Ranchu.

- The Oranda – the first variety to have the outgrowths on the head which are known as “wen”. As well as the head growths this breed has a round body, and long divided tail and anal fin. Tigerhead Orandas, which have very heavy wen growths on the head, first appeared in the 1800s but have remained in small numbers with the current standard for the Oranda stating that the wen should not be overdeveloped.





In 1611 the first goldfish entered Europe via Portugal. Ownership of goldfish soon became a status symbol, associated with wealth and good luck because of their shiny, metallic scales. As goldfish became more common, they lost this symbolic appeal. Linnaeus, the founder of modern taxonomy, named the goldfish as *Cyprinus auratus* in 1758 (later reclassified as *Carassius auratus*). He also described forms of goldfish which have double anal fins and bifurcate (split in two) caudal fins.

The origin of the globe or telescope eyed breeds, such as the popular Moors, is less well known but probably began sometime in the late 1500s. The Celestial goldfish, a globe eyed variety with upturned eyes and no dorsal fin is thought to have been developed in China in the 1700s, although some sources claim Korea as the origin for this iconic form. The Bubble Eye type, a more extreme progression of the Celestial, first appeared in the 1900s.

Goldfish may have reached North America as early as the 1820s, from various unofficial reports. The first officially recorded shipment was in 1878, coming from Japan. They were initially introduced as a species to be farmed for food, but quickly became popular as ornamental fish. The Comet, a long tailed variant of the common goldfish, was developed in the United States in the late 1800s to early 1900s. Another favourite breed, the Pearlscale also came to light at around this time. It is a very round, almost golf-ball shaped fish with a defining scale type. Calcium carbonate deposits collect in the scales to give each of them a thickened dome shape. The scales are also nacreous, meaning that they have a dull mother-of-pearl sheen.

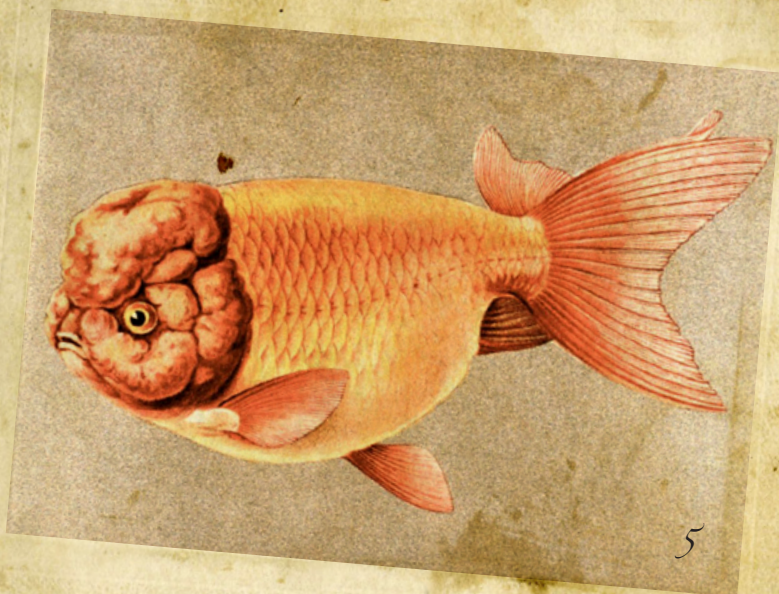
The Shubunkin variety arrived around 1900, developed by Kichigoro Akiyama of Japan. This is a single finned fish which has a striking calico pattern of red and black spots on a white background. The name Shubunkin roughly translates to "red brocade" in Japanese.

## Conclusions

The long history of Goldfish is as amazing as the shapes and colours of Goldfish themselves. Now kept commonly worldwide and bred in their millions each year, Goldfish hold a unique place in the aquarium and pond trade as one of the most successful coldwater fish on the planet! If you've never kept Goldfish, we hope this article has been an inspiration to keep this ancient breed of fish. ♣

## Illustrations

1. a double-tailed wakin goldfish
2. the traditional ryukin with its exaggerated shoulder hump



3. a beautiful 1908 illustration of the Shubunkin, presumably a relatively rare type at the time having been developed only 10 years prior.
4. a Demekin goldfish, showing enlarged eyes typical of moors.
5. the Ranchu of 1908 is not so different to the type bred today.

## Acknowledgements

This article has used a number of textures by Renee Robinson, we are grateful to her for allowing use of her work with acknowledgement under a creative commons license. Her flickr stream 'playingwithbrushes' is inspirational - we recommend you visit her!  
[flickr.com/photos/playingwithpsp/](http://flickr.com/photos/playingwithpsp/)





# Water garden

## Pennywort

Pennywort (*Hydrocotyle vulgaris*) is a commonly available perennial pond plant that grows to 10-20 cm (4-8") in height. This bog plant is widespread, being native to Europe and occurring from Britain and Scandinavia in the north to Greece and North Africa in the south. The species can grow submerged but growth is better if the foliage is exposed. Pennywort grows mainly by stolons (lateral stems) which root at the nodes from which new leaves emerge. The species grows most vigorously in regions without frost, however, it is frost tolerant coping with temperatures as low as  $-15^{\circ}\text{C}$  ( $5^{\circ}\text{F}$ ). Propagation is straightforward, by dividing clumps or removing stolons as they extend away from the main plant. The plant does produce flowers in summer and these get readily pollinated resulting in small amounts of seed as winter approaches. The species grows best in semi-shade, submerged plants require much more intense lighting. The species, allegedly, has edible leaves which when cooked have a carrot-like flavour, though we cannot vouch for this. In warm regions the species can be a little weedy, though it is easy to remove as it is shallow rooted.



## Water Hyssop

*Bacopa monnieri*, known by a range of common names including Coastal Waterhyssop, Brahmi, Thyme-leaved gratiola and Water hyssop is a perennial, mat forming bog plant. The species naturally occurs in swamps, bogs and wetlands in India, Nepal, Sri Lanka, China, Taiwan, and Vietnam. The species is naturalised elsewhere and occurs as a garden escape in the southern USA, Hawaii and warm zones in Australia. The species is moderately frost tolerant, withstanding temperatures below freezing reasonably well, however the species grows more vigorously in frost free regions. Like Pennywort, Water Hyssop grows best with its roots underwater and leaves above the water line. It can be grown fully submerged, but requires very bright lighting to succeed under these conditions. Water hyssop requires more light than Pennywort and should be planted in a sunnier position around the pond. Like many water plants, the species strikes easily and cuttings can be taken for propagation purposes.



Photo of *Bacopa monnieri* courtesy Forest and Kim Starr



# Water Hibiscus

*Hibiscus coccineus* is a truly beautiful pond plant, that grows from submerged roots, primarily out of water. Because the species can reach 2 m (6') in height, it's best grown towards the back of the pond or in sodden soil directly adjacent to a waterfall, where the soil moisture is constantly maintained.

A native of the coastal swamps of Florida and Georgia, the species is sensitive to the cold and dies down over winter. In regions with frost, the plant should be potted and placed in the pond for late-spring, summer and early autumn only. The leaves of the species distinctly resemble cannabis, to which the species is not related. Unlike many *Hibiscus* species, the flowers which develop in summer and autumn, have widely spaced petals, giving the flower an open, more primitive appearance than the various hybrid Hawaiian *Hibiscus* species. 🌺



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# KAKADU SECRETS

by Andrea Wait.

It's a long weekend in the Northern Territory and, like most people in Darwin, we're frantically packing up the car with swags, eskies, the odd fishing rod and binoculars. We slam the boot shut and the car sags dangerously low to the ground as we all pile in, breathe deeply and quickly shut the doors before everything spills out on to the footpath and we have to start all over again.

Heading out on the Stuart Highway there's a steady stream of traffic. There are utes with muddy quad-bikes tied to the tray, caravans with stickers saying "Where the hell is Noonamah" (for the record, it's a township just out of Darwin), and cars like ours with people squashed in them who look exceedingly uncomfortable, but excited about the prospect of three days of bush camping, fishing and adventure.

As the Stuart Highway leaves Darwin in the distance and branches out into a myriad of destinations like Katherine, Daly River and Litchfield National Park, the cars start to disperse, and we blink our way left at the intersection just before we are about to reach Pine Creek. We're on our way to Kakadu.

About 200,000 people visit Kakadu each year and there's little need to question why. It's one of the most special and beautiful places in Australia, indeed the world, and is World Heritage listed not only for its natural significance, but its cultural importance.

So most people know that Kakadu has magnificent landscapes including wetlands, rocky escarpments and waterfalls. Most people also know that there is rock art thousands of years old, with stories that have been handed down through dozens of generations. Most people have also heard about the amazing wildlife: Kakadu is full of every kind of creature imaginable, nearly 300 species of birds, plus kangaroos, dingoes, frill-necked lizards and barramundi.

But what about all the stuff that people don't know? This weekend we're exploring the secrets of Kakadu and are getting off the well-beaten track in search of an Australian icon less-explored. Ask

Maguk Top Pool



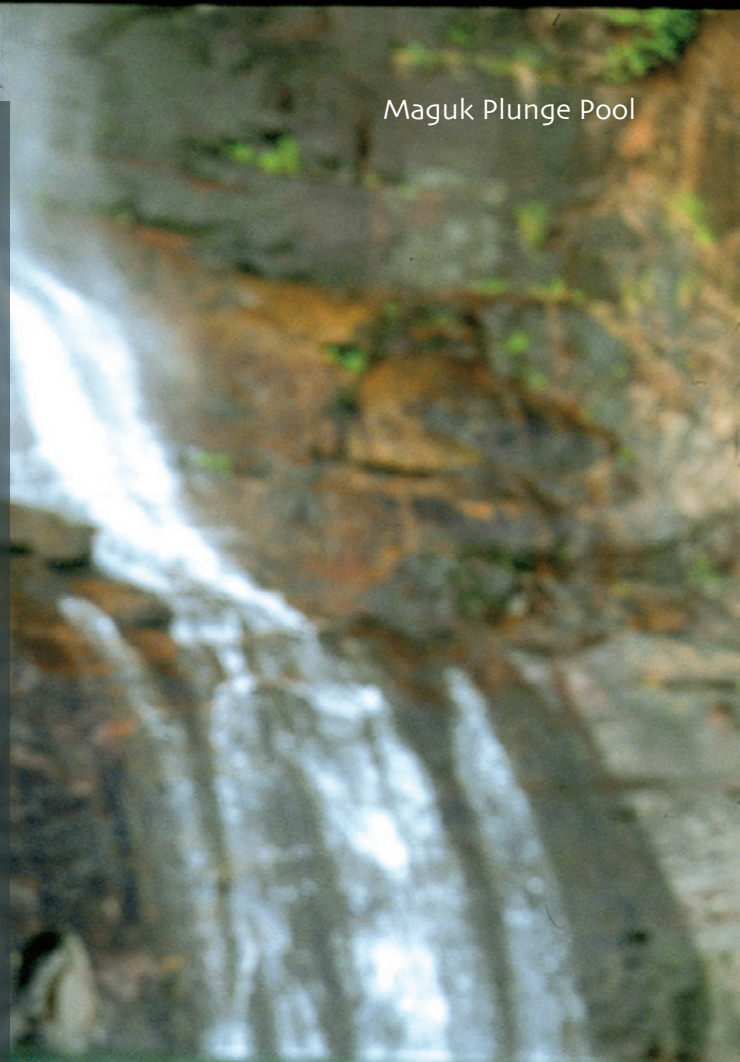
almost any local in Darwin and they'll point you in the right direction.

Off the beaten track:

To do something different, explore the southern-end of Kakadu National Park. Instead of turning at Humpty Doo, a rural community which is surrounded by thousands of mango trees and has a huge replica crocodile wearing boxing gloves, continue down the Stuart Highway towards the historic gold rush town of Pine Creek. Just before Pine Creek, you turn left and enter through the southern entrance of the Park.

**Gunlom Falls:** This plunge pool is one of the most picturesque places at Kakadu, with spectacular views over the southern region of the park. It is about a 40km drive in from the Kakadu Highway on a gravel road, just inside the southern entry to the Park. Pitching a tent at the pretty little camping ground at the end makes the drive all worthwhile. During the wet season (December – April) access is restricted. Always check the latest access reports from the Bowali Visitors Centre in Jabiru or at [www.deh.gov.au/parks/kakadu/](http://www.deh.gov.au/parks/kakadu/).

**Yurmikmik:** Located on the way to Gunlom Falls, Yurmikmik is an area of separate but interconnected walking tracks. The individual walks are: Boulder Creek Walk (2km return); Yurmikmik Lookout Walk (5km return); Motor Car Falls (7.5km return) and Kurrundie Creek Walk (11km return).




Barramundie Gorge,  
Kakadu National Park



Kakadu National Park

*Images courtesy : Tourism NT*





Maguk Plunge Pool: This is a four-wheel-drive destination only. There's a 2km monsoon forest walk at this pretty spot with a small waterfall and clear plunge pool. Turn off the Kakadu Highway 44km north of the southern entry station and travel a further 12km.

Travelling back to Darwin, the windows are wound down and the wind is whipping all conversation into non-existence. The car is significantly lighter and we're contemplating our return to work the next day. We've been camping at Kakadu. It's a place most people think only consists of icons like Nourlangie Rock and Jim Jim Falls.

How could they be so wrong? ❖❖



# FISH OF KAKADU

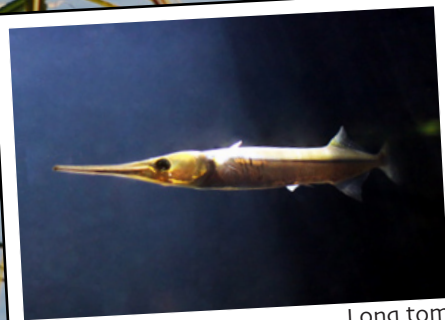
Kakadu hosts some 53 species of freshwater fish, including beautiful rainbow fish, gudgeons, grunters, freshwater longtoms and the ancient arowana-like saratoga.



Archerfish. Photo by Xinmin Li



Sooty Grunter. Photo by Patrick Keogh



Long tom



Saratoga

While iconic brackish water species such as the archerfish or barramundi are well studied, the remaining estuarine (salinities from ~25 to 30‰) fish biota are poorly understood. In 1999 a study was conducted by Helen K Larson and coworkers to assess the brackish water fish diversity in Kakadu and found 161 species from 59 fish families.

This survey found a new genus of gobiid fish, (related to the genus *Eggles-tonichthys*) and possible new species of *Amoya*. They also observed a scat (from genus *Rhinoprenes*) that inflated its body like a puffer fish.

It is noteworthy that Kakadu is a National Park and there are rules and regulations on fishing/collecting, particularly for small fishes. These should be investigated prior to any collection of species in this region. It is also worth stressing that the park (like much of Northern Australia) is home to the Saltwater Crocodile and as such professional advice should definitely be sought before venturing out to collect fish in regions known to have crocodiles!

